Part V

Additional Seismic Evaluation Procedures Modified from the SQUG GIP

11. RELAY FUNCTIONALITY REVIEW

11.1 INTRODUCTION

As part of the seismic evaluation of DOE facilities, it may be necessary to perform a relay seismic functionality review. The purpose of this review is to determine if the equipment listed on the Seismic Equipment List (SEL), as described in Chapter 4, could be adversely affected by relay malfunction in the event of a Design Basis Earthquake (DBE) and to evaluate the seismic adequacy of those relays for which malfunction is unacceptable. The term "relay malfunction" is used to designate relay chatter or inadvertent change-of-state of the electrical contacts in a relay, motor starter, or switch. The purpose of this section of the DOE Seismic Evaluation Procedure is to provide an overview of the relay evaluation procedure and describe the interfaces between other activities described in the DOE Seismic Evaluation Procedure and the relay evaluation.

Information on a detailed procedure for evaluating relays is contained in Section 6 of the SQUG GIP (Ref. 1) and in its supporting documents. The SCEs and relay evaluation personnel should not use the material in this chapter unless they have thoroughly reviewed and understood the information in Section 6 of the SQUG GIP and its supporting documents. The DOE Seismic Evaluation Procedure contains a condensed version of the detailed procedure in the SQUG GIP. In Sections 11.2 through 11.5, the relay functionality review is intended to identify most of the essential relays that should be evaluated, to provide the procedure for evaluating those relays, and to be a cost effective approach for identifying "bad actors". Section 11.2 discusses three methods for establishing the seismic capacity of relays and includes a list of low ruggedness relays. Section 11.3 provides two methods for determining the seismic demand on relays mounted in cabinets or other structures. The seismic capacity is compared to the seismic demand using the guidelines of Section 5.4. Section 11.4 provides information for conducting a walkdown as part of the relay evaluation. This walkdown can be incorporated as part of the Screening Evaluation and Walkdown described in Section 2.1.3. Finally, Section 11.5 discusses techniques for resolving relay outliers.

11.2 SEISMIC CAPACITY OF RELAYS

11.2.1 Generic Seismic Test Data[1]

Seismic test data is available on a variety of types of relays. These data have been reduced to Generic Equipment Ruggedness Spectra (GERS) in Reference 44 which define seismic acceleration levels below which relays can be expected to function without chatter or other damage. The GERS are seismic response spectra within which a class or subclass of relays has functioned properly during shake-table tests. In some cases the GERS are based on "success" data (that is, seismic test spectra for which no relay malfunction occurred). In this case, the test spectra for one or more relays in a given class represent a lower bound of the seismic ruggedness of the class. In other cases, the GERS may be based on "fragility" data as the seismic response spectra in which failures or malfunctions occurred. In this case, the GERS represent an upper bound of the seismic ruggedness of the relay class. Where both success and fragility data are available for a given relay class, the GERS fall between the two spectra. Engineering judgment was used in developing the GERS level to smooth out sharp peaks and valleys in the test response spectra.

An example GERS for several auxiliary relay types is shown in Figure 11.2-1. A normalized GERS shape is illustrated at the top of this figure and GERS levels (i.e., the peak acceleration) for example relays are tabulated at the bottom of this figure. Complete sets of all available GERS for relays are given in Reference 44.

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[1] Based on Section 6.4.1 of SQUG GIP (Ref. 1)

11.2.2 Earthquake Experience Data[2]

Data have been obtained on relay performance, specific failures, relay vulnerabilities, and other information from actual earthquake experience in industrial power plants and other facilities which have undergone significant earthquakes. This information has been used to identify unacceptable relay types such as those which are known to be susceptible to damage or chatter due to moderate shaking. Unacceptable relays and related contact devices that must be avoided are listed and considered in the screening procedure given in Reference 45. Based on earthquake experience data and on test data, solid state relays and mechanically-actuated switches are considered seismically rugged and need not be evaluated for relay chatter. Details and restrictions regarding the screening of both the low-ruggedness and high-ruggedness classes of control circuit devices are described in Reference 45.

Table 11.2-1 from Appendix E of Reference 45 provides a list of low ruggedness relays, or "bad actors". The relay evaluation procedure seismic demand determination and GERS cannot be applied to these relays because of their low seismic ruggedness or demonstrated sensitivity to high frequency vibration. Relays listed in Table 11.2-1 should be classified as outliers and case specific techniques or current qualification techniques must be utilized to demonstrate the adequacy of these relays.

11.2.3 Relay-Specific Test Data[3]

The GERS and earthquake experience data discussed above are expected to apply to many of installed relay types in essential circuits. Facility-specific and relay-specific seismic test data, where available, can also be used. This seismic test data is generally maintained by specific facilities and/or relay suppliers and has not been included in the relay GERS. It may be used on a relay-specific or facility-specific basis.

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2 Based on Section 6.4.1 of SQUG GIP (Ref. 1)

3 Based on Section 6.4.1 of SQUG GIP (Ref. 1)

Table 11.2-1 Low Ruggedness Relays (Appendix E of Reference 45)

RELAY	OPERATING MODE	REFERENCES
GE CFD	All	1 (81-14/313, 82-26/348, 86-13/293, 2, 3, 4, 5 (IN 85-82), 6
GE CFVB	All	2, 3, 6
GE CEH	All	2, 6
GE CPD	All	2, 6
GE IJD+ (non 1E)	All	2
GE PVD 11 and PVD21	All	1 (84-20/352, 3, 4 (GE)
GE RAV11	All	4 (GE)
GE HGA	(DE, NC)	1 (84-18/331, 86-15/269, 87-11/250), 4, 5, (IN 88-14)
GE BFA65	All	4 (BNL)
W HLF	All	2, 6
W HU (non 1E)	All	3, 6
W ITH	All	1 (81-44/346 NS 81-37/346)
W ARMLA	All	5 (IN 82-55)
W PMQ	All	1 (85-16/247)
W SG	(DE, NC)	4 (ANCO)
W SV	All	4 (BNL)
W SC	All	4 (BNL)
W SSC	All	4 (BNL)
W COM-5 (Non 1E)**	All	4 (W)
ASEA ARMX-L	AII	1 (88-06/387)
English Electric YCG+	All	2
Mercury Switches	All	1 (86-25/249), 2
Sudden Pressure Switches π	All	2

References:

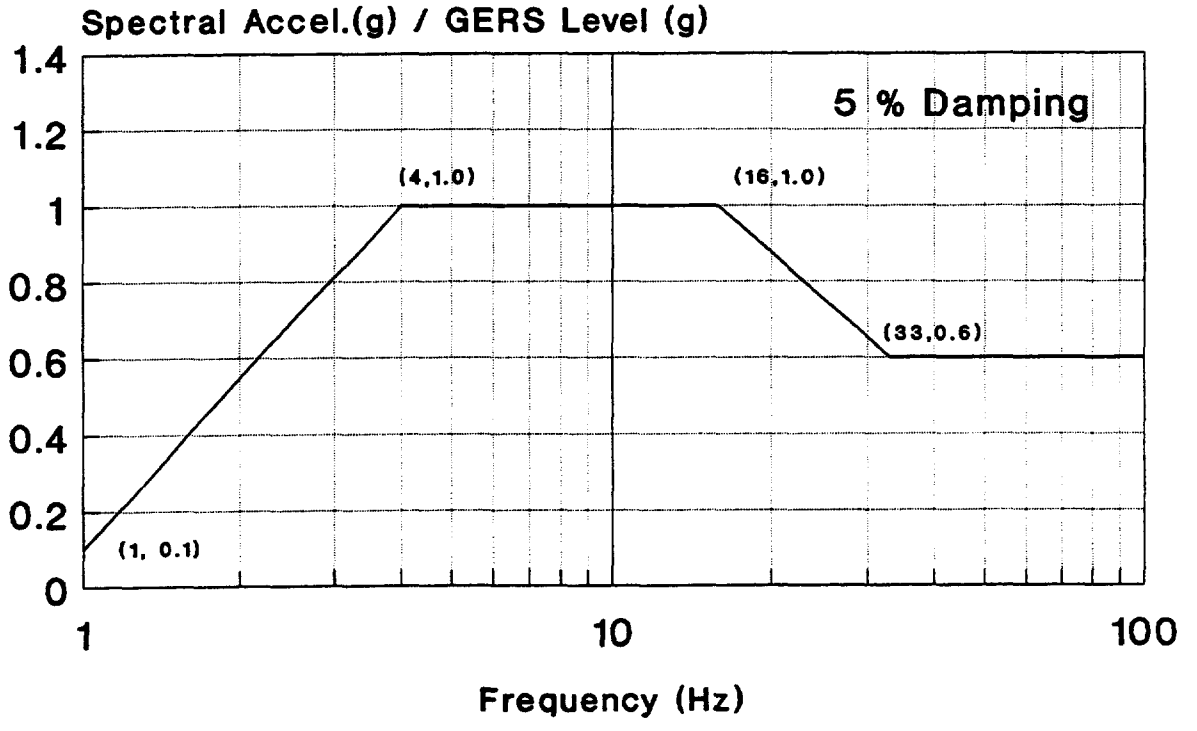
1. LERS
2. Earthquake Experience Data
3. SAFEGUARDS Data
4. IEEE 501 Test Data
5. Notices, Bulletins, etc.
6. Induction cup or induction cylinder design

* DE = De-energized
E = Energized
NC = Normally Closed Contact
NO = Normally Open
All = All Modes

\+ Damage has occurred to this relay in an earthquake and it must be assumed that it will be inoperable following a DBE level earthquake.

π Transformer pressure surge sensing devices

** With SSC-T IITH unit



Type and Submodel Identification	GERS Level[1] Non-Operate NO[2]	Non-Operate NC[2]	Operate NO/NC[2]
Make #1, Model A	10	9	10
Make #2, Model A	10	9	10
Make #2, Model B	10	-[3]	10
Make #3, Model A	10	9	10
Make #4, Model A	10	5	10
Make #5, Model A	10	10	10

1 "GERS Level" is the spectral acceleration (g) from 4 to 16 Hz for 5% damping.
2 "NO" = Normally Open; "NC" = Normally Closed; "NO/NC" = Change State.
3 "-" = Data not available.

Figure 11.2-1 Generic Equpment Ruggedness Spectra (GERS) for Auxiliary Relays (Reference 44) (Figure 6-2 of SQUG GIP, Reference 1)

11.3 SEISMIC DEMAND ON RELAYS

This section has two methods for determining the seismic demand on relays. Seismic adequacy of essential relays can be confirmed by successful application of either one of these methods. Details on the methods for determining seismic demand on relays is contained in Section 6 of the SQUG GIP (Ref. 1) and in its supporting documents. After computing the seismic demand on the relays, the demand is then compared to the seismic capacity (discussed in Section 11.2) using the guidelines of Section 5.4.

11.3.1 Use of In-Cabinet Amplification Factors[4]

The first method for determining relay seismic demand is based on: (1) using a Seismic Demand Spectrum (SDS) at the base of the cabinet containing the relay and (2) multiplying this spectrum by an in-cabinet Amplification Factor (AF). To use this method, the essential relay should not be one of the low-ruggedness types listed in Table 11.2-1. The seismic demand on relays can be represented by an In-cabinet Demand Spectrum (IDS) which is computed using the following equation:

$$IDS = SDS \times AF$$

Where:

SDS - Seismic Demand Spectrum (SDS) as described in Section 5.2.3. The SDS is a scaled in-structure response spectrum computed from the DBE.

AF - in-cabinet Amplification Factor, as given in Table 11.3-1, for various types of cabinets. The guidelines and criteria for identifying the various cabinet types are included in Appendix I of Reference 45.

A relay is considered seismically adequate if the IDS is bounded by the relay capacity spectrum in the frequency ranges from 4 - 16 Hz and from 33 Hz and above, i.e., the zero period acceleration (ZPA). If the guidelines for this method cannot be applied, or the seismic demand is not bounded by the seismic capacity of the relay, then the following method can be used instead.

[4] Based on Section 6.4.2 of SQUG GIP (Ref. 1)

Table 11.3-1 In-Cabinet Amplification Factors for Use with Section 11.3.1 (Table 6-2 of SQUG GIP, Ref. 1)

Type of Cabinet	In-Cabinet Amplification Factor (AF)[1]
MCC-type cabinet (defined in Appendix I of Reference 45)	3
Conventional control panel or benchboard (defined in Appendix I of Reference 45)	4.5[2]
Switchgear-type cabinet or similar large unsupported panel (defined in Appendix I of Reference 45)	7
Other type of cabinet, panel, or enclosure for which cabinet-specific amplification data exists	[3]

1 The SCEs and relay evaluation personnel should not apply these amplification factors unless they have thoroughly reviewed and understood the information in Section 6 of the SQUG GIP (Ref. 1) and its supporting documents such as References 43 and 45.

2 To use an amplification factor of 4.5, the control panel or benchboard must meet the restrictions (or caveats) given in Reference 45, Appendix I, except that a 13 Hz lower bound fundamental frequency shall apply instead of the 11 Hz fundamental frequency specified by the relevant caveat in Reference 45, Appendix I, when assessing:

devices located on internal independent racks,
cantilevered appendages, such as cantilevered wing walls attached to a front face or side wall, and
access doors which are part of a control panel or benchboard.

Note that one intent of the control panel and benchboard caveats is to restrict use of this amplification factor to only those cabinets and panels which have all significant natural modes at 13 Hz and higher. The amplification factor is a function of the panel frequency with the most flexible panel mode typically being the diaphragm, or out-of-plane, mode.

3 For the "Other" type of cabinets, an effective broad-based amplification factor can be developed from appropriate test data. Reference 43 can be used for this purpose as a guide in which an effective in-cabinet amplification factor can be obtained by multiplying the measured peak amplification factor, for the location in the cabinet where the relay is mounted, times an appropriate reduction factor. Appropriate reduction factors are discussed in Reference 43; for typical, narrow peak amplification spectra, the reduction factor is 0.6.

11.3.2 Use of In-Cabinet Response Spectra[5]

In this method, the technique of computing relay seismic demand is the same as in Section 11.3.1 (i.e., the demand spectrum is bounded by the capacity spectrum in the frequency ranges from 4 - 16 Hz and from 33 Hz and above) except that instead of using an in-cabinet amplification factor to determine the seismic demand on the relay, an in-cabinet response spectrum is used. To use this method, the essential relay should not be one of the low-ruggedness types listed in Table 11.2-1. For comparison to relay capacity spectrum, the in-cabinet response spectrum can be treated similar to the IDS of Section 11.3.1. There are two methods for developing in-cabinet response spectra, depending upon the type of equipment:

Control Room Benchboards and Panels. An amplified, in-cabinet response spectrum can be determined using the methodology and software described in Reference 43 for control room benchboards and panels. In this option, the cabinet or panel evaluated must meet the restrictions (or caveats) given in Reference 43. A 13 Hz lower bound frequency shall apply instead of the 11 Hz fundamental frequency specified by the relevant caveat in Reference 43 when assessing devices located on internal independent racks, cantilevered appendages such as cantilevered wing walls attached to a front face or side wall, and access doors which are part of a control panel or benchboard. Note that one intent of the control panel and benchboard caveats is to restrict use of this amplification factor to only those cabinets and panels that have all significant natural modes at 13 Hz or higher. The use of Reference 43 software should not be extended to other classes of equipment without the review and approval of the DOE.

Other Types of Equipment. For other types of cabinets and panels that are not covered by Reference 43, in-cabinet response spectrum can be determined using analytical and/or test methods which are suitable for the specific case. These other methods should be justified in the documentation of the Relay Functionality Review. This is equivalent to the case-specific analysis and/or test approach. Caution should be exercised when using this method to determine in-cabinet response spectra by considering the effects of local flexibility and mounting details such as local plastic deformation, slotted holes, fitted connections, etc.

11.4 RELAY WALKDOWN[6]

Information on a detailed procedure for conducting relay walkdowns is contained in Section 6 of the SQUG GIP (Ref. 1) and in its supporting documents. The SCEs and relay evaluation personnel should refer to the details in these documents when conducting relay walkdowns. A walkdown should be performed as a part of the relay evaluation. The purposes of the relay walkdown are to:

- Obtain information needed to determine cabinet types which house essential relays and to determine the in-cabinet amplification, where needed, for the seismic capacity methods described above.
- Evaluate the seismic adequacy of the cabinets or enclosures which support the essential relays.
- Spot check mountings of essential relays.
- Spot check the essential relays to evaluate their types and locations, including checks for vulnerable relays (as listed in Table 11.2-1).

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[5] Based on Section 6.4.2 of SQUG GIP (Ref. 1)
[6] Based on Section 6.5 of SQUG GIP (Ref. 1)

These purposes can be accomplished during one walkdown or separately during different walkdowns. To accomplish the first purpose of the relay walkdown, the cabinets or panels which house essential relays should be identified and the information needed to determine in-cabinet amplification should be reviewed. A SCE and a Relay Reviewer (as discussed in Section 3.3.3) should accomplish this purpose. The serial and model number of the relays should be compared with the applicable relay numbers in References 43 and 45.

The second purpose, evaluation of the seismic adequacy of the cabinet or enclosure supporting the relay, should be done as a part of the Screening Evaluation and Walkdown as described in Section 2.1.3. Note that the cabinets or enclosures supporting essential relays should be identified prior to this walkdown.

The third purpose of the relay walkdown is to spot check relay mountings to confirm that relays are mounted in accordance with manufacturer's recommendations. The objective of the spot checks is to identify any abnormal or a typical relay mounting techniques. The specific number of relays to be checked is not quantified because the bulk of the relays addressed in the relay evaluation procedure are typically located in a few specific facility areas and can be easily checked. Most of the relays encountered in the relay evaluation can be checked by opening relay cabinets in the following areas:

- Control room
- Relay room or auxiliary control room
- Switchgear rooms
- Diesel generator control panel area

Spot checking relay mountings can be performed during a separate relay walkdown by personnel familiar with relay installation. Alternatively, relay mountings may be spot checked during the seismic walkdown when in-cabinet amplification information is gathered. Special preparation or training is not required for spot checking relay mountings. Indications such as proper relay label orientation, mounting bolts in place and tight, and whether the relay is snug in its mounting bracket are sufficient to judge the adequacy of the mounting; analytical checks are not intended except as a means to evaluate atypical mountings.

The fourth purpose of the relay walkdown is to confirm relay types and locations. This can be performed at the same time that the relay mountings are checked and by the same individuals. The approach for confirming relay types by the relay walkdown team includes noting relay types observed in the cabinets and then comparing this with the relays identified on electrical drawings. It is important to note that relay mountings are considered to be standard and the circuit drawings are assumed to be correct and up-to-date. Spot checks of the relay mountings and relay types are a mechanism to confirm these assumptions. Any significant spot check discrepancies will necessitate more thorough relay inspections.

11.5 OUTLIERS[7]

An outlier is defined as an essential relay which does not meet the guidelines for:

- Relay seismic capacity and seismic demand as given in Sections 11.2 and 11.3
- Relay mounting as given in Section 11.4

Chapter 12, Outlier Identification and Resolution, is used when an outlier is identified and the cause(s) for not meeting the guidelines should be documented with the Outlier Seismic Evaluation Sheet (OSES) provided in Chapter 13. Methods are given in this section for use as a generic basis to evaluate the seismic adequacy of essential relays. Therefore, if an essential relay fails these generic methods, it may not necessarily be deficient for seismic loading; however, additional evaluations are needed to show that it is adequate. Some of the additional evaluations and alternative methods for demonstrating seismic adequacy are summarized below.

- Refine the seismic requirements and/or analyses.
- Test the relay and/or the cabinet in question.
- Re-design and modify the circuit to make the relay function nonessential.
- Relocate the relay to reduce the seismic demand imposed upon it.
- Replace the relay with a seismically qualified one.
- Stiffen the relay mounting.
- Use other justifiable approaches.

Generic methods for resolving outliers are also discussed in Chapter 12.

[7] Based on Section 6.6 of SQUG GIP (Ref. 1)

12. OUTLIER IDENTIFICATION AND RESOLUTION

12.1 INTRODUCTION[1]

The purpose of this chapter is to define the term outliers, how they should be identified and documented, and how they may be resolved. An outlier is an item of equipment that does not comply with all of the screening guidelines provided in the DOE Seismic Evaluation Procedure. The screening guidelines are intended to be used as a generic basis for evaluating the seismic adequacy of equipment at DOE facilities. If an item of equipment fails to pass these generic screens, it may still be shown to be adequate for seismic loading by additional evaluations.

This chapter describes how outliers should be identified and documented for equipment that does not pass the screening guidelines for:

- Electrical Equipment (Sections 8.1)
- Mechanical Equipment (Sections 8.2 and 10.2)
- Tanks (Sections 9.1 and 10.3)
- Piping, Raceway, and Duct Systems (Sections 9.2, 10.1, and 10.4)
- Architectural Features and Components (Section 10.5)
- Relays (Chapter 11)

Several generic methods for resolving outliers are summarized in this chapter. Specific methods for addressing the different types of equipment are also discussed in the sections where the screening guidelines are described.

The chapter is organized as follows:

- A summary of generic methods for resolving outliers is contained in Section 12.2.
- Suggested methods for grouping and pooling of outliers from several different facilities for efficient reconciliation are provided in Section 12.3.
- The reasons for classifying an item of equipment as an outlier are described in Section 13.3 along with a description of how outliers should be documented.

12.2 OUTLIER RESOLUTION[2]

Several generic methods for resolving outliers are summarized below. Additional specific methods for addressing outliers for the different types of equipment are also discussed in the sections where the screening guidelines are described. The details for resolving outliers, however, are beyond the scope of this procedure. It is the responsibility of the facility to resolve outliers using their existing engineering procedures as they would resolve any other seismic concern.

It is permissible to resolve outliers by performing additional evaluations and applying engineering judgment to address those areas which do not meet the screening guidelines contained in this

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[1] Based on Section 5.0 of SQUG GIP (Ref. 1)
[2] Based on Section 5.3 of SQUG GIP (Ref. 1)

procedure. Strict adherence to the screening guidelines in the DOE Seismic Evaluation Procedure is not absolutely required; however, these additional outlier evaluations and the application of engineering judgment should be based on a thorough understanding of the screening guidelines contained in the DOE Seismic Evaluation Procedure and the background and philosophy used to develop these guidelines as given in the applicable references. The justification and reasoning for considering an outlier to be acceptable should be based on mechanistic principles and sound engineering judgment.

The screening guidelines have been thoroughly reviewed by experts to ensure that they are acceptable for generic use in DOE facilities; however, the resolution of outliers for individual facilities will not likely receive the same level of review as the generic screening guidelines. Therefore, it is recommended that the evaluations and judgments used to resolve outliers be thoroughly documented so that independent reviews can be performed if necessary as discussed in Section 2.2.

Some of the methods summarized below for resolving outliers build upon the earthquake experience and generic testing data discussed in the DOE Seismic Evaluation Procedure. Facility personnel may use the Screening Evaluation and Walkdown procedure described in Section 2.1.3 in applying earthquake experience or generic testing data which was not available during the initial walkdown for resolution of outliers or they may develop an alternative approach which best fits the circumstances of the specific outlier issue. Outlier issues may also be resolved using current procedures and criteria. As an alternative, facility personnel may choose to not perform corrective modifications or replacement of outliers. Instead, facility personnel must then explain to the DOE the safety implications of not modifying or replacing the outliers.

Methods which can be used to resolve outliers include the following:

1. The subject equipment and/or its anchorage may be fixed or modified to bring it within the scope of the DOE Seismic Evaluation Procedure or in compliance with some other seismic qualification method. For example, appropriate anchorage should be installed for equipment lacking adequate anchorage.

2. The subject equipment and/or its anchorage may be evaluated more rigorously to determine appropriate techniques for strengthening it in order to bring it within the scope of the DOE Seismic Evaluation Procedure or in compliance with some other seismic qualification method. For example, the equipment or its supports may be stiffened so that its resonant frequency is increased to a frequency where the seismic demand is less. Providing an upper lateral support to a floor-mounted item of equipment would typically increase the fundamental frequency to above 8 Hz.

3. The subject equipment may be replaced with equipment which is covered by screening guidelines in the DOE Seismic Evaluation Procedure or has been seismically qualified by some other means.

4. Detailed engineering analyses may be performed to more carefully and/or accurately evaluate the seismic capacity of the equipment and/or the seismic demand to which it is exposed. For example, when using more accurate analytical procedures, consideration should be given to using "as-built" rather than specified minimum material properties for the equipment.

5. The earthquake experience equipment class may be expanded to include the equipment or specific equipment features of interest. The scope of the earthquake experience data which is documented in References 19 and 35 represents only a portion of the total data available.

An expansion of the earthquake experience equipment classes beyond the scope included in Chapters 8, 9, 10, and 11 could include a more detailed breakdown by type, model or manufacturer of a particular class of equipment, less restrictive requirements for inclusion within a class, or development of a sub-category with higher capacity.

Extension of the generic experience equipment classes beyond the descriptions in the DOE Seismic Evaluation Procedure is subject to DOE review and to an extensive peer review beyond what is discussed in Section 2.2. The external peer review for expanding the earthquake experience database should be of similar caliber as that required during the original development of the database. An extension of the earthquake experience database must satisify the requirements discussed in Section 1.4.4.

6. In-situ tests may be performed on the equipment of interest to determine more accurately the equipment dynamic properties.

7. Shake table tests may be performed on the same or similar equipment to check its seismic capacity or evaluate more carefully its dynamic properties.

8. Information not available during the Screening Evaluation and Walkdown may be obtained and used to meet the DOE Seismic Evaluation Procedure screening guidelines.

The most appropriate type of outlier evaluation will depend upon a number of factors, including the reason that the equipment failed the screening guidelines, whether the outlier lends itself to additional review of the earthquake experience or generic testing data or an additional analytical evaluation, the cost of design or hardware modifications, and how extensive the problem is in the facility and in other facilities. Any type of outlier evaluation will require peer review as discussed in Section 2.2. The DOE should be provided with a proposed schedule for complete resolution or future modifications and replacement of outliers. Documentation of the methods used by the facility for resolution of outlier issues and tracking of their implementation can be provided in the OSES as discussed in Section 13.3.

12.3 GROUPING AND POOLING OF OUTLIERS[3]

Once an outlier has been identified and an OSES is prepared for that item of equipment, the OSES could then be placed in an appropriate outlier category or "basket". There could be one basket for each class of equipment for which there are outliers. Within each basket the outliers could be further divided into the various reasons that the equipment failed the screening evaluation (e.g., capacity vs. demand, caveats, anchorage, or interactions). The organization of the outliers in this manner can facilitate reconciliation of recurring outlier issues.

One method to efficiently reconcile recurring outliers in DOE facilities is for them to pool the outlier information obtained during walkdowns. One means of pooling this information is to tabulate the outliers, including the information contained on the SEDS and, if available, the method ultimately used to evaluate the seismic adequacy of the outlier. These tables may be generated and organized, using a data base management program. This summary may be distributed to DOE facilities so that common outliers may be evaluated using the experience obtained from other facilities. For example, one facility may have one or several unreconciled outliers that an SRT at another facility was able to evaluate. The facility with the unreconciled outliers may be able to employ a similar methodology if the detailed information used in the outlier resolution is shared. Outliers from several DOE facilities may also be resolved more cost-effectively using shared funding.

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[3] Based on Section 5.4 of SQUG GIP (Ref. 1)

13. DOCUMENTATION

13.1 INTRODUCTION[1]

This section describes the various types of documents that should be generated with the Screening Walkdown and Evaluation Procedure and how they relate to each other. This section also describes the types of information which could be submitted to the DOE. The following five major types of documents are used with the DOE Seismic Evaluation Procedure:

- Seismic Equipment List (SEL)
- Screening Evaluation Work Sheets (SEWS)
- Outlier Seismic Evaluation Sheets (OSES)
- Screening Evaluation and Data Sheets (SEDS)
- Equipment Seismic Evaluation Report (ESER)

The Seismic Equipment List (SEL) and supporting documents should describe the overall approach used in identifying the equipment listed in the SEL and the basis for selecting the listed equipment. In addition, the SEL and its supporting documentation should describe the method used for verifying the compatibility of the SEL with the facility operating procedures. Further guidance for developing the SEL is provided in Chapter 4, which discusses the contents of and methods for generating the SEL.

The Screening Evaluation Work Sheets (SEWS), Outlier Seismic Evaluation Sheets (OSES), Screening Evaluation and Data Sheets (SEDS), and Equipment Seismic Evaluation Report (ESER) are discussed in Sections 13.2, 13.3, 13.4, and 13.5, respectively. Copies of the SEWS, OSES, and SEDS forms follow Section 13.5. The forms contained in the DOE Seismic Evaluation Procedure are suggested formats for documenting the information from the seismic evaluations. Other forms, which contain equivalent information to those discussed in this chapter, may be used to document the results of the seismic evaluations using this Procedure.

The extent of suggested documentation for the seismic evaluations is limited. The underlying reason is that the evaluations are to be done by highly-qualified individuals who have been trained in the use and application of the DOE Seismic Evaluation Procedure. For example, SCEs should have the background, experience, and training to make engineering judgments during the facility walkdown and thus avoid having to develop large quantities of backup documentation to record every decision made in applying the procedure. These SCEs are then held accountable for the scope, accuracy, and completeness of the Screening Evaluation and Walkdown process by signing that the results of the seismic evaluations are correct and accurate. One of these signatories should also be a licensed Professional Engineer, as discussed in Section 3.2.

13.2 SCREENING EVALUATION WORK SHEETS[2]

The purpose of the Screening Evaluation Work Sheets (SEWS) is to provide a convenient summary and checklist of the seismic evaluation criteria described in the DOE Seismic Evaluation Procedure. During the seismic walkdown, the SEWS can serve as a tool for collecting and organizing the important information from the seismic evaluation. The SEWS, or a similar checklist, should be used during the facility walkdown to document the results of the evaluation.

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[1] Based on Section 9.0 of SQUG GIP (Ref. 1)

[2] Based on Appendix G of SQUG GIP (Ref. 1)

Equipment class caveats and guidelines are summarized on the SEWS. Other informal documentation may be used by the SCEs as aids during the Screening Evaluation and Walkdown. These may include calculations, sketches, photographs, and charts. The SEWS should not be used unless the user has a thorough understanding of the DOE Seismic Evaluation Procedure and the reference documents.

There are 26 SEWS for most of the classes of equipment discussed in the DOE Seismic Evaluation Procedure. The 26 SEWS correspond to the following classes of equipment and sections from Chapters 8 through 10:

Batteries on Racks (Section 8.1.1)
Motor Control Centers (Section 8.1.2)
Low-Voltage Switchgear (Section 8.1.3)
Medium-Voltage Switchgear (Section 8.1.4)
Distribution Panels (Section 8.1.5)
Transformers (Section 8.1.6)
Battery Chargers and Inverters (Section 8.1.7)
Instrumentation and Control Panels (Section 8.1.8)
Instruments on Racks (Section 8.1.9)
Temperature Sensors (Section 8.1.10)
Fluid-Operated/Air-Operated Valves (Section 8.2.1)
Motor-Operated Valves (Section 8.2.2 MOV)
Solenoid-Operated Valves (Section 8.2.2 SOV)
Horizontal Pumps (Section 8.2.3)
Vertical Pumps (Section 8.2.4)
Chillers (Section 8.2.5)
Air Compressors (Section 8.2.6)
Motor-Generators (Section 8.2.7)
Engine-Generators (Section 8.2.8)
Air Handlers (Section 8.2.9)
Fans (Section 8.2.10)
Horizontal Tanks and Heat Exchangers (Section 9.1.2)
Cable and Conduit Raceway Systems (Section 9.2.1)
Piping (Section 10.1.1)
HVAC Ducts (Section 10.4.1)

SEWS are not provided for several classes of equipment. For these classes of equipment, the SEWS for Section 10.X.X can be used as a template and the checklists provided in the sections for those classes of equipment can be used during the facility walkdown. SEWS are not provided for the following classes of equipment and sections:

Vertical Tanks (Section 9.1.1)
Underground Piping (Section 10.1.2)
HEPA Filters (Section 10.2.1)
Glove Boxes (Section 10.2.2)
Miscellaneous Machinery (Section 10.2.3)
Underground Tanks (Section 10.3.1)
Canisters and Gas Cylinders (Section 10.3.2)
Unreinforced Masonry (URM) Walls (Section 10.5.1)
Raised Floors (Section 10.5.2)
Storage Racks (Section 10.5.3)
Relays (Chapter 11)

Most of the information at the top of each SEWS (equipment ID number, equipment description, equipment location, etc.) can be entered on the SEWS prior to the facility walkdown. If a data base program is used to develop the SEL, then the information at the top of each page of the SEWS can be printed directly from the data base file containing the SEL information.

The SEWS can be used as a checklist by circling the appropriate symbol in response to each statement. The meaning of the symbols is given below:

Y - Yes. This criterion is met. ("Y" is always the favorable response, i.e., all the "Y" symbols should be circled if an item of equipment is seismically adequate.)

N - No. This criterion is not met.

U - Unknown. It cannot be determined whether this criterion is met at this time. (This response can be used while the screening evaluation is in progress to identify criteria which must be evaluated later.)

N/A - Not Applicable. Some of the criteria may not apply for a particular item of equipment.

Some of the statements on the SEWS ask which of several alternatives is being used in the Screening Evaluation and Walkdown and the meaning of these symbols is self-explanatory. Likewise, when all the questions have a final response, the last question in each section of the SEWS can then be answered.

The SEWS also provide space to record information about the item of equipment, to document any comments the SCEs may wish to make, to document the reason why the intent of any caveats and guidelines are met without meeting the specific wording of the caveat rule, to sketch the equipment, and to sign off. In addition, the SEWS has a "Recommend Resolution" section to summarize the equipment evaluation. For equipment identified as an outlier, this section provides space to identify potential outlier resolution approaches. The resolution choices are:

- Maintenance action
- Further evaluation
- Retrofit design
- Other
- No further action required. Equipment is seismically adequate.

At the bottom of the SEWS are signature lines for all those performing the Seismic Evaluation and Walkdown. As discussed in Chapter 3, there should be at least two SCE signatories and one of the SCEs should be a licensed Professional Engineer. A signature on the SEWS indicates the SCE is in agreement with all the entries and conclusions entered on the sheet and all signatories should agree with all the entries and conclusions.

The SEWS are designed to be compatible with the Screening Evaluation Data Sheets (SEDS) discussed in Section 13.4 so that the summary information from the SEWS can be transferred directly to the SEDS. The responses to the final question in each section of the SEWS and the overall conclusion can be entered directly into the appropriate column in the SEDS discussed in Section 13.4.

13.3 OUTLIER SEISMIC EVALUATION SHEETS[3]

The Outlier Seismic Evaluation Sheets (OSES) are used to document the reason(s) for an item of equipment identified as an outlier during a screening evaluation to fail the screening guidelines. A separate OSES should be completed for each item of equipment classified as an outlier as discussed in Chapter 12.

An item of equipment listed in the SEL, as described in Chapter 4, should be identified as an outlier if it does not meet the screening guidelines covered in the other sections of this procedure. If an item of equipment is identified as an outlier during a screening evaluation in one of the sections of the DOE Seismic Evaluation Procedure, then the reason(s) for failing to satisfy the screening guidelines can be documented on an Outlier Seismic Evaluation Sheet (OSES). Other documentation, such as the Screening Evaluation Work Sheets (SEWS) discussed in Section 13.3, also have provisions for outliers. A separate OSES should be completed for each item of equipment classified as an outlier. The information to be included in each of the four sections of the OSES is described below.

Section 1 of the OSES describes the item of equipment identified as an outlier. This is the same information as found in the first seven columns of the SEDS which is discussed in Section 13.4. On the OSES, however, more space is provided to describe the equipment so that more details can be included to facilitate later resolution of this outlier issue without requiring repeated trips into the facility.

Section 2 of the OSES defines those conditions which cause that item of equipment to be classified as an outlier. This section should identify which of the conditions is the cause for the item of equipment becoming an outlier. More than one condition may be the cause for the outlier. In addition, the reason(s) for the equipment being an outlier should be described in more detail. For example, the SCEs could indicate at what frequencies the demand exceeded the capacity.

Section 3 of the OSES can be used to provide a proposed method for resolving the outlier issue, based on the experience and detailed evaluation of that item of equipment by the SCEs or the Lead Relay Reviewer. This is an optional part of the outlier identification process. This section also provides space for supplying any additional information which may be used to implement the proposed method of resolution. This may include information such as an estimate of the fundamental natural frequency of the equipment.

13.4 SCREENING EVALUATION AND DATA SHEETS[4]

The results of the Screening Evaluation and Walkdown, as described in Section 2.1.3, should be documented on walkdown checklists. These checklists include the Screening Evaluation Work Sheets (SEWS) discussed in Section 13.2 and the Screening Evaluation Data Sheets (SEDS). Preparation of the SEDS includes a review of generic and facility-specific seismic documentation and a facility walkdown of the equipment listed on the SEL. The completed SEDS constitute a tabulated summary for the formal documentation of the Screening Evaluation and Walkdown and reflect the final judgment of the SCEs. The SEDS offer a convenient way for tabulating the significant information from the SEWS for all the equipment listed on the SEL.

The SEDS is arranged in rows and columns and each row contains one item of equipment listed in the SEL. The columns contain information about the equipment and the results of the Screening Evaluation and Walkdown. Guidelines for completing each of the columns are provided below.

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[3] Based on Section 5.2 of SQUG GIP (Ref. 1)

[4] Based on Section 4.6 of SQUG GIP (Ref. 1)

At the bottom of the SEDS are two sets of suggested signature blocks to be signed by those performing the Seismic Evaluation and Walkdown. The first block should be signed by all the SCEs who performed the Screening Evaluation and Walkdown. There should be at least two signatories and one of which should be a licensed Professional Engineer. A signature indicates the SCE is in agreement with all the entries and conclusions entered on the SEDS. All signatories should agree with all the entries and conclusions.

The second block for signatures at the bottom of the SEDS is for use by a safety professional, systems engineer, or operations engineer who may provide critical information to the SCEs during their seismic evaluation of the equipment. Examples of such information include how a piece of equipment operates or whether a feature on the equipment is needed to accomplish its safety function. Information of this type is particularly important if an item of equipment is found during the walkdown which should be added to the SEL. It is left to the SCEs to determine whether this second block of signatures is needed. Only the signature of the safety professional, systems engineer, or operations engineer should be documented on the SEDS and details of the information supplied to the SCEs need not be included.

Note that the completed SEDS reflect the final judgment of the SCEs. Prior to arriving at this final judgment, there may have been several walkdowns, calculations, and other seismic evaluations which form the basis for determining whether the equipment meets the screening guidelines contained in the DOE Seismic Evaluation Procedure.

Compilation of the information on the SEDS can be done using a data base management system. This makes it possible to manipulate the order in which the equipment is listed on the sheets. It may be convenient to use SEDS by location in the facility. This may optimize the routing of the SCEs during the walkdowns so that backtracking is minimized and separate teams of SCEs can cover different parts of the facility. After the walkdown is complete, the data base management system can be used to sort the equipment on the SEDS into lists of outliers or other categories of equipment.

The contents of each of the 16 columns of the SEDS are described below.

Columns 1 through 6 contain information for identifying and locating the equipment on the SEL.

Column 1 contains the equipment class number.

Column 2 contains the facility identification or tag number for the equipment. This is normally an alpha-numeric designation by which an item of equipment is uniquely identified in the facility. This identifier will permit direct access and a cross-reference to the existing facility files or data system for the item of equipment.

Column 3 contains both a designation of the facility system to which the equipment belongs and a description of the equipment. If the system designation is placed at the beginning of this field, then the equipment list can be sorted by system with a data base management system.

Column 4 identifies the building in which the equipment is located.

Column 5 contains the floor elevation from which the item of equipment can be viewed by the SCEs.

Column 6 contains a designation of the location of the equipment within the building. An example of this is by building column line intersection, such as F-12. This indicates the intersection of column lines F and 12. Alternatively, the room designation can be given; e.g., diesel generator room (DG room).

Columns 7 through 10 are used to document the source of the seismic capacity and the source of the seismic demand.

Column 7 contains the elevation at which the equipment is mounted; i.e., the elevation at which the equipment receives its seismic input (demand). This elevation should be determined by the SCEs during the walkdown. Note that this elevation may not be the same as the floor elevation given in Column 5.

Column 8 identifies the source of the seismic capacity. The following codes may be used:

DOC	Component-Specific Seismic Qualification Documentation.
RS	Reference Spectrum (for comparison to in-structure response spectra).
GERS	Generic Equipment Ruggedness Spectra, GERS.

If the GERS are used, a number designation (XXX) should also be given to indicate which unique GERS is used. If seismic qualification documentation is used, reference to the documentation should be noted in Column 16.

Column 9 indicates the experience data factor, F_{ED}, for the equipment.

Column 10 indicates the method used to define the seismic demand. The following codes may be used:

SDS	Seismic Demand Spectrum
IDS	In-Cabinet Demand Spectrum

If an in-structure response spectrum is used, a number designation should also be given to indicate which unique spectrum is used.

Columns 11 through 14 are used to document the results of the evaluation of the equipment against the four seismic screening guidelines: comparison of seismic capacity to seismic demand, caveat and guidelines compliance, anchorage adequacy, and seismic interaction.

Column 11 indicates whether capacity of the equipment exceeds the demand imposed on it. The following codes may be used:

Y	Yes, capacity exceeds demand.
N	No, capacity does not exceed demand.
U	Unknown whether capacity exceeds demand.

Column 12 indicates whether the equipment is within the scope of the earthquake/testing equipment class and meets the intent of all the caveats and guidelines for the equipment class. The following codes may be used:

Y Yes, the equipment is in the equipment class, and the intent of all applicable caveats and guidelines is satisfied.

N No, the equipment is not in the equipment class, or the intent of all applicable caveats and guidelines is not satisfied.

U Unknown whether the equipment is in the equipment class or whether the intent of all applicable caveats is satisfied.

N/A The earthquake/test equipment class and the caveats and guidelines are not applicable to this item of equipment.

Column 13 indicates whether the equipment anchorage meets the anchorage screening guidelines. The following codes may be used:

Y Yes, anchorage capacities equal or exceed seismic demand, and anchorage is free of gross installation defects and has adequate stiffness.

N No, anchorage capacities do not equal or exceed the seismic demand, or anchorage is not free of gross installation defects, or anchorage does not have adequate stiffness.

U Unknown whether anchorage capacities equal or exceed seismic demand, or whether anchorage is free of gross installation defects or has adequate stiffness.

N/A Anchorage guidelines are not applicable to this equipment; e.g., valves are not evaluated for anchorage.

Column 14 indicates whether the equipment is free of adverse seismic interaction effects. The following codes may be used:

Y Yes, the equipment is free of interaction effects, or the interaction effects are acceptable and do not compromise the function of the equipment.

N No, the equipment is not free of adverse interaction effects.

U Unknown whether interaction effects will compromise the function of the equipment.

Columns 15 and 16 are used to document the overall result of the equipment evaluation and to record a note number for explaining anything unusual for an item of equipment.

Column 15 indicates whether, in the final judgment of the SCEs, the seismic adequacy of the equipment is verified. Note that this judgment may be based on one or more walkdowns, calculations, and other supporting data. The following codes are used:

Y Yes, seismic adequacy has been verified, i.e., code "Y", for all the applicable screening guidelines:

(1) seismic capacity is greater than demand,
(2) the equipment is in the earthquake/test equipment class and the intent of all the caveats and guidelines is met,
(3) equipment anchorage is adequate, and
(4) seismic interaction effects will not compromise the function of the item of equipment.

N No, seismic adequacy does not meet one or more of the seismic evaluation criteria. Equipment is identified as an outlier requiring further effort in accordance with Chapter 12.

Note that there is no "Unknown" category in Column 15 since this column represents the final judgment by the SCEs. At this point, the item of equipment should be either verified to be seismically adequate (Y) or found to be lacking in one or more areas (N) and should be evaluated as an outlier in accordance with Chapter 12.

Column 16 can be used for explanatory notes. A number can be entered in this field which corresponds to a list of notes which provide additional information on the seismic evaluation of equipment. For example, a note could indicate that a solenoid-operated valve is mounted on the yoke of an air-operated valve (AOV) and is evaluated as a component mounted within the "box" of this AOV. This column should also be used to identify when the intent of any caveat and guidelines is met, but the specific wording of the rule is not needed.

13.5 EQUIPMENT SEISMIC EVALUATION REPORT[5]

The Equipment Seismic Evaluation Report (ESER) should summarize the equipment seismic evaluations which result from applying the procedures in the DOE Seismic Evaluation Procedure. The following information should be documented in the ESER:

- Resumes of the SCEs in the SRT.
- Description of the seismic design basis of the facility, description of the seismic demand of the facility including the design basis earthquake (DBE), identification of the performance category and function of the facility, description of the site characteristics, and basis for establishing the degree of uncertainty in the natural frequency of the building structure if unbroadened response spectra are used with frequency shifting of response peaks.
- List of systems and components in the SEL.
- Screening Evaluation and Walkdown documentation including the SEWS, OSES and SEDS.
- Notes, photographs, drawings, calculations, assumptions, and judgments, as appropriate, used to justify the Screening Evaluation and Walkdown.

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[5] Based on Section 9.4 of SQUG GIP (Ref. 1)

- Results of the Screening Evaluation and Walkdown for equipment on the SEDS forms, including descriptions of any cases which specific caveats and guidelines are met by intent without meeting the specific wording of the caveat rule.
- Description of outliers on OSES and SEWS forms and explanations of the safety and operation implications of not resolving these outliers.
- Results of engineering evaluations, tests, calculations, equipment modifications, and equipment replacements as well as a proposed schedule to resolve outliers.
- Description of significant or programmatic deviations from the DOE Seismic Evaluation Procedure.

DOE Seismic Evaluation Procedure

SEWS 8.1.1 (1 of 4) Sheet 1 of _____

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Batteries on Racks**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Battery type:	Individual Battery Weight:	
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference: _____

Caveats (Section 8.1.1)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Plates of the cells are lead-calcium flat-plate, Planté or of Manchex design	Y	N	U	N/A
3.	Each individual battery weighs less than 450 lbs	Y	N	U	N/A
4.	Close-fitting, crush-resistant spacers fill two-thirds of vertical space between cells	Y	N	U	N/A
5.	Cells restrained by end and side rails	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Batteries on Racks**

Equipment description:

Caveats (Cont.)

6.	Racks have longitudinal cross bracing	Y	N	U	N/A
7.	Wood racks evaluated to industry accepted standards	Y	N	U	N/A
8.	Batteries greater than 10 years old specifically evaluated for aging effects	Y	N	U	N/A
9.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Plates of the cells are lead-calcium flat-plate design (i.e., not Manchex design)	Y	N	U	N/A
4.	Batteries supported on two-step racks or single-tier racks; restrained by double side and end rails which are symmetrically located with respect to the cell center-of-gravity	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Batteries on Racks**

Equipment description:

Anchorage (Cont.)

11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Batteries on Racks**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Motor Control Centers**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight of each Cabinet:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.2)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	600 V rating or less	Y	N	U	N/A
3.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	Y	N	U	N/A
4.	Attached weight (except conduit) less than about 100 lbs per cabinet assembly	Y	N	U	N/A
5.	Externally attached items rigidly anchored	Y	N	U	N/A

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor Control Centers**

Equipment description:

Caveats (Cont.)

6.	General configuration similar to NEMA standards	Y	N	U	N/A
7.	Cutouts in lower half less than 6 in. wide and 12 in. high	Y	N	U	N/A
8.	All doors secured by latch or fastener	Y	N	U	N/A
9.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Floor-mounted cabinet	Y	N	U	N/A
4.	Average weight per section less than 800 pounds	Y	N	U	N/A
5.	Base anchorage utilizing MCC base channels	Y	N	U	N/A
6.	Adequate strength and stiffness in load transfer path from anchorage to base frame (only for "function after" GERS)	Y	N	U	N/A
7.	Essential relays have GERS > 4.5g (only for "function during" GERS)		Y	N	U N/A
8.	Able to reset starters (only for "function after" GERS)	Y	N	U	N/A
9.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together.	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor Control Centers**

Equipment description:

Anchorage (Cont.)

11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor Control Centers**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Low-Voltage Switchgear**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight of each Cabinet:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.3)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	600 V rating or less	Y	N	U	N/A
3.	Side-to-side restraint of draw-out circuit breakers is provided	Y	N	U	N/A
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	Y	N	U	N/A
5.	Attached weight (except conduit) less than about 100 lbs per cabinet assembly	Y	N	U	N/A
6.	Externally attached items rigidly anchored	Y	N	U	N/A
7.	General configuration similar to ANSI C37.20 standards	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Low-Voltage Switchgear**

Equipment description:

Caveats (Cont.)

8.	Cutouts in lower half of cabinet side sheathing less than 30% of width of side panel wide and less than 60% of width of side panel excluding bus transfer compartment	Y	N	U	N/A
9.	All doors secured by latch or fastener	Y	N	U	N/A
10.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Floor-mounted enclosure	Y	N	U	N/A
4.	Manufactured by major vendor (ITE/Brown Boveri, Westinghouse, or GE)	Y	N	U	N/A
5.	Average weight per section less than 1,600 lbs	Y	N	U	N/A
6.	For 2.5g level GERS, vertical restraint prevents breaker uplift	Y	N	U	N/A
7.	For 2.5g level GERS, outside corners of end units are reinforced, if needed	Y	N	U	N/A
8.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Low-Voltage Switchgear**

Equipment description:

Anchorage (Cont.)

11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Low-Voltage Switchgear**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	Equipment Class: Medium-Voltage Switchgear	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight of each cabinet:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

   Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.4)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	2.4 kV to 4.16 kV rating	Y	N	U	N/A
3.	Internally mounted potential and/or control power transformers are restrained to prevent damage to or disconnection of contacts	Y	N	U	N/A
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	Y	N	U	N/A
5.	Attached weight (except conduit) less than about 100 lbs per cabinet bay	Y	N	U	N/A
6.	Externally attached items rigidly anchored	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Medium-Voltage Switchgear**

Equipment description:

Caveats (Cont.)

7.	General configuration similar to ANSI C37.20 standards	Y	N	U	N/A
8.	Cutouts in lower half of cabinet side sheathing less than 30% of width of side panel wide and less than 60% of width of side panel excluding bus transfer compartment	Y	N	U	N/A
9.	All doors secured by latch or fastener	Y	N	U	N/A
10.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Floor-mounted enclosure	Y	N	U	N/A
4.	The switchgear is not a specially-designed type	Y	N	U	N/A
5.	Circuit breakers are truck-mounted type, not jack-up or vertical lift	Y	N	U	N/A
6.	Average weight per vertical section less than 5,000 lbs	Y	N	U	N/A
7.	For 2.5g level GERS, vertical restraint prevents circuit breaker uplift	Y	N	U	N/A
8.	For 2.5g level GERS, circuit break arc chutes are restrained horizontally	Y	N	U	N/A
9.	For 2.5g level GERS, a Beaver Type Z relay is <u>not</u> used in Westinghouse MV switchgear for the "Y" anti-pump relay	Y	N	U	N/A
10.	Separate evaluation of breaker racking mechanism completed; seismic positioner or sufficient side-to-side restraints used	Y	N	U	N/A
11.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2. Appropriate characteristics for anchorage type checked (size, location, equipment characteristics) Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Medium-Voltage Switchgear**

Equipment description:

Anchorage (Cont.)

3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N	U	N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N	U	N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

Comments

SEWS 8.1.4 (4 of 4) Sheet 4 of _____

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Medium-Voltage Switchgear**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Distribution Panels**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight of each Panel:		
Wall mounted:	Floor mounted:	
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

   Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.5)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Contains only circuit breakers and switches	Y	N	U	N/A
3.	All latches and fasteners in door secured	Y	N	U	N/A
4.	Adjacent cabinets which are close enough to impact, or sections of multi-bay cabinets, are bolted together if they contain essential relays	Y	N	U	N/A
5.	Wall- or floor-mounted NEMA type-enclosure	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Distribution Panels**

Equipment description:

Caveats (Cont.)

6.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	If Switchboard GERS used, item is freestanding and designated as a switchboard by the manufacturer	Y	N	U	N/A
4.	No Westinghouse Quicklag Type E Breakers	Y	N	U	N/A
5.	Adjacent cabinets which are close enough to impact are bolted together	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Distribution Panels**

Equipment description:

Anchorage (Cont.)

11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Distribution lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Distribution Panels**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Transformers**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight:		
Drawing No.:	Performance Category:	
Type (air cooled, oil cooled):	Voltage:	
Wall mounted:	Floor mounted:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.6)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	4.16 kV rating or less	Y	N	U	N/A
3.	For floor-mounted dry- and oil-type unit, transformer coils are positively restrained within cabinet	Y	N	U	N/A
4.	For 750 kVA or larger units, coils are top braced or adequately shown by evaluation	Y	N	U	N/A
5.	For 750 kVA or larger units, 2-inch clearance is provided between energized component and cabinet	Y	N	U	N/A
6.	For 750 kVA or larger units, the slack in the connection between the high-voltage leads and the first anchor accommodates 3-inch relative displacement	Y	N	U	N/A

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Transformers**

Equipment description:

Caveats (Cont.)

7.	For wall-mounted units, transformer coils anchored to enclosure near enclosure support surface	Y	N	U	N/A
8.	For floor-mounted units, anchorage does not rely on weak-way bending of cabinet structures under lateral forces	Y	N	U	N/A
9.	Adjacent cabinets which are close enough to impact are bolted together if they contain essential relays	Y	N	U	N/A
10.	All doors secured by latch or fastener	Y	N	U	N/A
11.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
Is the intent of all the caveats met for Reference Spectrum?		Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Dry-type unit (not oil-filled)	Y	N	U	N/A
4.	Wall- or floor-mounted NEMA-type enclosure	Y	N	U	N/A
5.	120 to 480 VAC rating	Y	N	U	N/A
6.	7.5 to 225 kVA rating	Y	N	U	N/A
7.	180 to 2,000 pounds weight	Y	N	U	N/A
8.	Internal supports provide positive attachment of transformer components	Y	N	U	N/A
9.	There is a sufficient clearance of 3/8 inches between bare conductors and enclosure	Y	N	U	N/A
10.	Adjacent cabinets which are close enough to impact are bolted together	Y	N	U	N/A
Is the intent of all the caveats met for GERS?		Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Transformers**

Equipment description:

Anchorage (Cont.)

11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N	U	N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Transformers**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Battery Chargers and Inverters**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Voltage Input:	Output	
Current:	Weight (approximate):	
Actuator type:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.7)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Solid state type	Y	N	U	N/A
3.	For floor-mounted, transformer positively anchored and mounted near base, or load path is evaluated	Y	N	U	N/A
4.	Base-assembly of floor-mounted unit properly braced or stiffened for lateral forces	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Battery Chargers and Inverters**

Equipment description:

Caveats (Cont.)

5.	For wall-mounted units, transformer supports and bracing provide adequate load path to the rear cabinet wall	Y	N	U	N/A
6.	All latches and fasteners in doors secured	Y	N	U	N/A
7.	Adjacent cabinets which are close enough to impact are bolted together if they contain essential relays	Y	N	U	N/A
8.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Silicon-controlled Rectifier (SCR) power controls; wall- or floor-mounted NEMA-type enclosure	Y	N	U	N/A
4.	Within range of battery charger ratings:				
	24-250 VDC	Y	N	U	N/A
	120-480 VAC	Y	N	U	N/A
	25-600 amps	Y	N	U	N/A
	150-2,850 pounds (floor mounted)	Y	N	U	N/A
	150-600 pounds (wall mounted)	Y	N	U	N/A
5.	Within range of inverter ratings:				
	120 VDC only	Y	N	U	N/A
	120-480 VAC	Y	N	U	N/A
	0.5-15 kVA	Y	N	U	N/A
	300-2,000 pounds	Y	N	U	N/A
6.	Heavy components are located in lower half of cabinet and are supported from base or rear panel with no panel cutouts adjacent to attachment	Y	N	U	N/A
7.	Adjacent cabinets which are close enough to impact are bolted together	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Battery Chargers and Inverters**

Equipment description:

Anchorage (Cont.)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N	U	N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Battery Chargers and Inverters**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Instrumentation and Control Panels**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Weight of each Panel:		
Manufacturer, model, etc.:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.8)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	No computers or programmable controllers	Y	N	U	N/A
3.	Strip chart recorders evaluated	Y	N	U	N/A
4.	Steel frame and sheet metal structurally adequate	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Instrumentation and Control Panels**

Equipment description:

Caveats (Cont.)

5.	Adjacent cabinets or panels which are close enough to impact, or sections of multi-bay cabinets or panels, are bolted together if they contain essential relays	Y	N	U	N/A
6.	Drawers and equipment on slides restrained from falling out	Y	N	U	N/A
7.	All doors secured by latch or fastener	Y	N	U	N/A
8.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Instrumentation and Control Panels**

Equipment description:

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N	U	N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
Is equipment free of interaction effects?		Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Instrumentation and Control Panels**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Instruments on Racks**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.9)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	No computers or programmable controllers	Y	N	U	N/A
3.	Steel frame and sheet metal structurally adequate	Y	N	U	N/A
4.	Adjacent racks which are close enough to impact, or sections of multi-bay racks, are bolted together if they contain essential relays	Y	N	U	N/A
5.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Instruments on Racks**

Equipment description:

Caveats (Cont.)

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Component is a pressure, temperature, level or flow transmitter	Y	N	U	N/A
4.	Component is one of the specific makes and models tested	Y	N	U	N/A
5.	Necessary function of component not sensitive to seismically induced system perturbations (e.g., sloshing)	Y	N	U	N/A
6.	No vacuum tubes	Y	N	U	N/A
7.	All external mounting bolts in place	Y	N	U	N/A
8.	Demand based on amplified portion of 3% damped floor response spectrum if estimated natural frequency of rack less than 33 Hertz	Y	N	U	N/A
9.	Rack capable of structurally transferring GERS level seismic loads to anchorage	Y	N	U	N/A
10.	Adjacent racks which are close enough to impact, or sections of multi-bay racks, are bolted together	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Instruments on Racks**

Equipment description:

Anchorage (Cont.)

11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Instruments on Racks**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SEWS 8.1.10 (1 of 3)

Sheet 1 of _____

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Temperature Sensors**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Approximate Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

   Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.1.10)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	No possibility of detrimental differential displacement between mounting of connection head and mounting of temperature sensor	Y	N	U	N/A
3.	Associated electronics are all solid state (no vacuum tubes)	Y	N	U	N/A
4.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Temperature Sensors**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

DOE Seismic Evaluation Procedure

SEWS 8.1.10 (3 of 3) Sheet 3 of _____

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Temperature Sensors**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Fluid-Operated/ Air-Operated Valves**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Smallest pipe diameter attached to valve:		
Pipe centerline to top of motor actuator length:		
Valve material:	Yoke material:	
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

   Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.1)

Reference Spectrum Fluid-Operated Valves (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	No cast-iron body	Y	N	U	N/A
3.	No cast-iron yoke (for spring-operated pressure relief or piston-operated valves)	Y	N	U	N/A

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Fluid-Operated/ Air-Operated Valves**

Equipment description:

Caveats (Cont.)

4.	Mounted on 1-inch diameter pipe or larger	Y	N	U	N/A
5.	Centerline of pipe to top of operator within restrictions or yoke can take static 3g load (for air-operated diaphragm, lightweight piston-operated, and spring-operated pressure relief valves)	Y	N	U	N/A
6.	Centerline of pipe to top of operator within restrictions or yoke can take static 3g load (for piston-operated valve of substantial weight)	Y	N	U	N/A
7.	Actuator and yoke not braced independently from pipe	Y	N	U	N/A
8.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS Air-Operated Valves (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Air-operated gate or globe valve with spring-opposed diaphragm-type pneumatic actuator	Y	N	U	N/A
4.	Use amplified response spectrum of piping system at piping/ valve interface	Y	N	U	N/A
5.	Valve and operator will not impact surrounding structures and components	Y	N	U	N/A
6.	Mounted on 1- to 3-inch nominal pipe line	Y	N	U	N/A
7.	Carbon steel (not cast iron) yoke or bonnet	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Fluid-Operated/ Air-Operated Valves**

Equipment description:

Anchorage (Cont.)

10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Fluid-Operated/ Air-Operated Valves**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SEWS 8.2.2 MOV (1 of 4) Sheet 1 of _____

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Motor-Operated Valves**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Smallest pipe diameter attached to valve:		
Pipe centerline to top of motor actuator length:		
Valve material:	Yoke material:	
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.2)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	No cast-iron body	Y	N	U	N/A
3.	No cast-iron yoke	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor-Operated Valves**

Equipment description:

Caveats (Cont.)

4.	Mounted on 1-inch diameter pipe or larger	Y	N	U	N/A
5.	Centerline of pipe to operator within restrictions or yoke can take static 3g load	Y	N	U	N/A
6.	Actuator and yoke not braced independently from pipe	Y	N	U	N/A
7.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below) (Note that GERS for this class apply to only motor operator and its connection to valve; valve itself and valve/pipe interface are not covered.)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Use amplified spectrum of piping system and valve at valve/operator interface	Y	N	U	N/A
4.	Motor axis is horizontal	Y	N	U	N/A
5.	Valve and operator will not impact surrounding structures and components	Y	N	U	N/A
6.	Motor controls remotely located	Y	N	U	N/A
7.	If valve has side mounted actuator attached to secondary reducer, seismic brackets are used				
8.	Manufactured by Limitorque or Rotork				
9.	Any loose or missing valve-to-operator bolts are tightened or replaced (tightness check not required)				
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor-Operated Valves**

Equipment description:

Anchorage (Cont.)

5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor-Operated Valves**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Solenoid-Operated Valves**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Smallest pipe diameter attached to valve:		
Pipe centerline to top of motor actuator length:		
Valve material:	Yoke material:	
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.2)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	No cast-iron body	Y	N	U	N/A
3.	No cast-iron yoke	Y	N	U	N/A

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Solenoid-Operated Valves**

Equipment description:

Caveats (Cont.)

4.	Centerline of pipe to operator within restrictions or yoke can take static 3g load	Y	N	U	N/A
5.	Actuator and yoke not braced independently from pipe	Y	N	U	N/A
6.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

GERS (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below) (Note that GERS for this class apply to only motor operator and its connection to valve; valve itself and valve/pipe interface are not covered.)

1.	Equipment is included in generic seismic testing equipment class	Y	N	U	N/A
2.	Meets all Reference Spectrum caveats	Y	N	U	N/A
3.	Use amplified spectrum for piping system at piping/valve interface	Y	N	U	N/A
4.	Valve and operator will not impact surrounding structures and components	Y	N	U	N/A
5.	Nominal pipe size is 1 inch or less	Y	N	U	N/A
6.	Valve body is forged brass or steel	Y	N	U	N/A
7.	Housing oriented in accordance with manufacturer's recommendations	Y	N	U	N/A
8.	Height of valve (pipe centerline to top of housing) does not exceed 12 in.	Y	N	U	N/A
9.	If SOV is a pilot on a larger valve, use amplified response spectrum at attachment point of SOV to larger valve	Y	N	U	N/A
10.	Use 3.5g ZPA GERS for ASCO Type 206-381	Y	N	U	N/A
	Is the intent of all the caveats met for GERS?	Y	N	U	N/A

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Solenoid-Operated Valves**

Equipment description:

Anchorage (Cont.)

7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Solenoid-Operated Valves**

Equipment description:

Comments (Cont.)

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Horizontal Pumps**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Drawing No.:	Performance Category:	
Weight:		
Horsepower/Motor rating: RPM	Head	Flow rate

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.3)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Driver and pump connected by rigid base or skid	Y	N	U	N/A
3.	Shaft has thrust restraint in both axial directions	Y	N	U	N/A
4.	No risk of excessive nozzle loads such as gross pipe motion or differential displacement	Y	N	U	N/A
5.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A
	Is the intent of all the caveats met for Reference Spectrum?	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Horizontal Pumps**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Horizontal Pumps**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SEWS 8.2.4 (1 of 3)

Sheet 1 of _____

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Vertical Pumps**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Drawing No.:	Performance Category:	
Weight:		
Horsepower/Motor rating: RPM	Head	Flow rate

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.4)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Casing and impeller shaft not cantilevered more than 20 feet, with radial bearing at bottom to support shaft	Y	N	U	N/A
3.	No risk of excessive nozzle loads such as gross pipe motion or differential displacement	Y	N	U	N/A
4.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Vertical Pumps**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Vertical Pumps**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Chillers**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.5)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Evaporator and condenser tanks reasonably braced between themselves for lateral forces without relying on weak-way bending of steel plates or structural steel shapes	Y	N	U	N/A
3.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SEWS 8.2.5 (2 of 3) Sheet 2 of _____

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Chillers**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Chillers**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SEWS 8.2.6 (1 of 3)

Sheet 1 of _____

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Air Compressors**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

   Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.6)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Air Compressors**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N	U	N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N	U	N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SEWS 8.2.6 (3 of 3)

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Air Compressors**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Motor-Generators**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference: _____

Caveats (Section 8.2.7)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Main driver and driven equipment connected by a rigid support or skid	Y	N	U	N/A
3.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor-Generators**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Motor-Generators**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Engine-Generators**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference: _____

Caveats (Section 8.2.8)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Driver and driven equipment connected by a rigid support or common skid	Y	N	U	N/A
3.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Engine-Generators**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Engine-Generators**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Air Handlers**	
Equipment description:		
System:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

   Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference: _____

Caveats (Section 8.2.9)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Anchorage of heavy internal components is adequate; internal vibration isolators have seismic stops to limit uplift and lateral movement	Y	N	U	N/A
3.	All doors secured by latch or fastener	Y	N	U	N/A
4.	No possibility of excessive duct distortion causing binding or misalignment of any internal fan	Y	N	U	N/A
5.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Air Handlers**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Air Handlers**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Fans**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference:_____

Caveats (Section 8.2.10)

Reference Spectrum (Identify with an asterisk (*) those caveats which are met by intent without meeting the specific wording of the caveat rule and explain the reason for this conclusion in the COMMENTS section below)

1.	Equipment is included in earthquake experience equipment class	Y	N	U	N/A
2.	Drive motor and fan mounted on common base	Y	N	U	N/A
3.	For axial fan with long shaft between fan and motor, shaft supported at fan as well as motor	Y	N	U	N/A
4.	No possibility of excessive duct distortion causing binding or misalignment of fan	Y	N	U	N/A
5.	Have you looked for and found no other adverse concerns?	Y	N	U	N/A

Is the intent of all the caveats met for Reference Spectrum? Y N U N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Fans**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	

Does anchorage capacity exceed demand? Y N U

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N	U	N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A

Is equipment free of interaction effects? Y N U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: Fans**

Equipment description:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: Horizontal Tanks and Heat Exchangers**	
Equipment description:		
Equipment Location: Bldg.	Floor El.	Room, Row/Col.
Manufacturer, model, etc.:		
Approximate weight:		
Drawing No.:	Performance Category:	

Functionality Requirement

- ❑ Contact Lead Relay Reviewer to determine if item contains Essential Relays
- ❑ For components whose function or structural integrity is required, complete all sections of this form.
- ❑ For all other components, only anchorage evaluation is required.

Caveats (Section 9.1.2)

(Identify with an asterisk (*) those steps which are met by intent without meeting the specific wording of the step and explain the reason for this conclusion in the COMMENTS section below)

Step 1	Parameters and values within range of applicable parameters	Y	N	U	N/A
Step 2	Anchor bolt tension and shear load allowables determined	Y	N	U	N/A
Step 3	Base plate bending strength reduction factor (RB) determined	Y	N	U	N/A
Step 4	Base plate weld strength reduction factor (RW) determined	Y	N	U	N/A
Step 5	Anchorage tension allowable determined using strength reduction factors	Y	N	U	N/A
Step 6	Ratios and values calculated	Y	N	U	N/A
Step 7	Acceleration capacity of tank anchorage determined	Y	N	U	N/A
Step 8	Flexibility of tank in transverse and vertical directions determined	Y	N	U	N/A
Step 9	Flexibility of tank in longitudinal direction determined	Y	N	U	N/A
Step 10	Capacity acceleration exceeds seismic demand acceleration	Y	N	U	N/A
Step 11	Saddle stresses checked	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Horizontal Tanks and Heat Exchangers**

Equipment description:

Anchorage (Chapter 6)

1. Type of anchorage:
   - ❑ expansion anchor
   - ❑ cast-in-place bolt or headed stud anchor
   - ❑ cast-in-place J-bolt
   - ❑ grouted-in-place bolt
   - ❑ welds to embedded steel on exposed steel
   - ❑ lead cinch anchors
   - ❑ Other _____
   - ❑ N/A (no further anchorage considerations)

2.	Appropriate characteristics for anchorage type checked (size, location, equipment characteristics)	Y	N	U	
3.	Gap at threaded anchor less than 1/4 inch	Y	N	U	N/A
4.	Base stiffness and no significant prying action requirements met	Y	N	U	
5.	Equipment base strength and structural load path adequate	Y	N	U	
6.	Embedment steel and pads requirements met	Y	N	U	N/A
7.	Embedment length requirements met	Y	N	U	
8.	Anchor spacing requirements met	Y	N	U	
9.	Edge distance requirements met	Y	N	U	
10.	Concrete strength requirements met	Y	N	U	
11.	Concrete crack requirements met	Y	N	U	
12.	Equipment with essential relays requirements met	Y	N	U	N/A
13.	Installation adequacy requirements met	Y	N	U	N/A
14.	No other concerns	Y	N	U	
	Does anchorage capacity exceed demand?	Y	N	U	

Reference: _____

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Horizontal Tanks and Heat Exchangers**

Equipment description:

Interaction Effects (Cont.)

6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
Is equipment free of interaction effects?		Y	N	U	

Comments

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Horizontal Tanks and Heat Exchangers**

Equipment description:

Comments (Cont.)

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SEWS 9.2.1 (1 of 6)

Sheet 1 of _____

SCREENING EVALUATION WORK SHEET (SEWS)		
Equipment ID No.:	**Equipment Class: Cable and Conduit Raceway Systems**	
Cable tray/Conduit identification:		
Systems:		
Building:	Floor El. (S):	Location:
Performance Category:		

Tray System or Conduit Boundary

Cable tray/Conduit description:

Description or sketch (attach sheets as necessary):

Functionality Requirement

- ❑ Maintain electrical cable function
- ❑ Maintain position

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Cable and Conduit Raceway Systems**

Cable tray/Conduit identification: _____

Systems: _____

Seismic Capacity vs. Demand (Chapter 5)

1. Seismic Capacity based on:
   - ❑ Reference Spectrum
   - ❑ GERS
   - ❑ Existing documentation
2. Elevation where equipment receives seismic input _____
   Seismic Demand Spectrum (SDS) based on:
   - ❑ In-structure response spectrum (IRS) per DOE-STD-1020
   - ❑ Other in-structure response spectrum (determine appropriate experience data scale factor)
   - ❑ Design basis earthquake (DBE) per DOE-STD-1020
   - ❑ Other _____

   Scale Factor (SF) _____ Experience Data Factor (F_{ED}) _____

Does capacity exceed demand? Y N U

Reference: _____

Inclusion Rules Review (Section 9.2.1)

1. Cable tray spans	Y	N	U	N/A
2. Conduit spans	Y	N	U	N/A
3. Tie downs	Y	N	U	N/A
4. Channel nuts	Y	N	U	N/A
5. Rigid boots	Y	N	U	N/A
6. Beam clamps	Y	N	U	N/A
7. Cast-iron inserts	Y	N	U	N/A

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Cable and Conduit Raceway Systems**

Cable tray/Conduit identification:

Systems:

General Walkdown Review (Section 9.2.1)

1.	Anchor bolts	Y	N	U	N/A
2.	Concrete condition	Y	N	U	N/A
3.	Corrosion	Y	N	U	N/A
4.	Sagging raceways	Y	N	U	N/A
5.	Broken or missing components	Y	N	U	N/A
6.	Restraint of cables	Y	N	U	N/A
7.	Aging of plastic ties	Y	N	U	N/A
8.	System hardspots	Y	N	U	N/A
	Welded connections	Y	N	U	N/A
	Components and sharp edges	Y	N	U	N/A
	Bare cables	Y	N	U	N/A
	Cable fill/ties	Y	N	U	N/A
	Short rods	Y	N	U	N/A

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
Is equipment free of interaction effects?		Y	N	U	

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)	
Equipment ID No.:	**Equipment Class: Cable and Conduit Raceway Systems**
Cable tray/Conduit identification:	
Systems:	
Analytical Review Support Selection	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)	
Equipment ID No.:	**Equipment Class: Cable and Conduit Raceway Systems**
Cable tray/Conduit identification:	
Systems:	

Analytical Review Data Sheet

Room No.: _____ Selection No.: _____

Location: _____

Description and Sketch:

Additional Notes:

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: Cable and Conduit Raceway Systems**

Cable tray/Conduit identification:

Systems:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SEWS 10.1.1 (1 of 3)

Sheet 1 of _____

SCREENING EVALUATION WORK SHEET (SEWS)

Piping System ID No.:

Equipment Class: Piping

Performance Category:

System Description and Fluid Boundaries:

Piping System Function and Contents

☐ Operability ☐ Pressure Boudary ☐ Position Retention

Piping Layout and Structural Boundaries
Piping System Location and Reference Drawings

Piping Materials and Sizes

Weights

Concurrent Pressure and Temperature

Input Response Spectra and SAM-Reference

☐ Final ☐ Preliminary

Applicability

☐ Ductile material ☐ D/t<50 ☐ -20°F ≤ T ≤ 250°F ☐ Reference Spectra

DOE Seismic Evaluation Procedure

SEWS 10.1.1 (2 of 3) Sheet 2 of _____

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)		
Piping System ID No.:	**Equipment Class: Piping**	
Screening Criterion (Section 10.1.1)	**Screening Criterion Met**	**Notes**
Construction: Piping, components and supports shall be undamaged and of good construction.		
Internal Degradation: Piping and components shall be free of signigicant internal degradation.		
External Corrosion: Piping, components and supports shall be free of significant external corrosion.		
Vertical Span: Piping shall be well supported vertically.		
Lateral Span: Piping shall be sufficiently restrained in the lateral direction.		
Anchor Motion: Piping shall have sufficient flexibility to accommodate the seismic motions of structures, equipment and headers to which it is attached.		
Mechanical Joints: Piping shall not contain mechanical joints which rely solely on friction.		
Flanged Joints: Flanged joints shall withstand the expected seismic moments without leakage.		
Equipment Nozzle Loads: Equipment shall not be subjected to large seismic loads from the piping systems.		
Eccentric Weights: Eccentric Weights in piping systems shall be evaluated.		
Flexible Joints: Flexible joints shall be properly restrained to keep relative end movements within vendor limits.		
Evaluation of Pipe Supports: Pipe supports shall be capable of withstanding seismic loads without failure.		
Interaction with Other Components: The piping being reviewed shall not be a source of interactions by displacement or swing impact on adjacent components.		
No other concerns		

DOE Seismic Evaluation Procedure

SEWS 10.1.1 (3 of 3)

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Piping System ID No.:	**Equipment Class: Piping**

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)

Equipment ID No.:	**Equipment Class: HVAC Ducts**	
HVAC line identification:		
System:		
Building:	Floor El. (s):	Location:
Operating Pressure:	PSIG	Inches of water
Performance Category:		

Duct System Boundary

Description or sketch (attach sheets as necessary):

Functionality Requirement

1. During seismic event	Y	N	U
2. After seismic event	Y	N	U

Structural Integrity Review (Section 10.4.1)

1. Duct free of damage, defects, and degradation	Y	N	U	N/A
2. Industry standard duct material and stiffeners are utilized	Y	N	U	N/A
3. Industry standard duct joints are utilized	Y	N	U	N/A
4. Support spans satisfy the criteria	Y	N	U	N/A
5. Ducts are properly tied-down to the supports	Y	N	U	N/A
6. Heavy in-line equipment is adequately restrained	Y	N	U	N/A
7. Appurtenances are positively attached to duct	Y	N	U	N/A
8. No stiff branch with flexible header	Y	N	U	N/A
9. No other concerns	Y	N	U	N/A
Are the above caveats met?	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.: | **Equipment Class: HVAC Ducts**

HVAC line identification:

System:

Pressure Boundary Integrity Review (Section 10.4.1)

	Is any pressure boundary integrity required? If the answer to the above question is NO, SKIP THIS SECTION	Y	N	U	
1.	Duct joints are rugged	Y	N	U	N/A
2.	Stiffener spacings are within the guidelines	Y	N	U	N/A
3.	Bolted flanged joints satisfy SMACNA (Tables G and H) requirements	Y	N	U	N/A
4.	No point supported round duct	Y	N	U	N/A
5.	Flexible bellows can accomodate motions	Y	N	U	N/A
6.	No additional concerns	Y	N	U	N/A
	Are the above caveats met?	Y	N	U	

Support Review (Section 10.4.1)

1.	Beam Clamps are oriented to preclude slipping off the support, channel nuts have teeth or ridges, and no cast-iron inserts	Y	N	U	N/A
		Y	N	U	N/A
2.	Support memeber capacity exceeds demand	Y	N	U	N/A
3.	Does the anchorage appear adequate?	Y	N	U	N/A
4.	No broken or obviously defective hardware				
5.	No additional concerns	Y	N	U	N/A
	Are the above caveats met?	Y	N	U	

Interaction Effects (Chapter 7)

1.	Soft targets free from impact by nearby equipment or structures	Y	N	U	N/A
2.	If equipment contains sensitive essential relays, equipment free from all impact by nearby equipment or structures	Y	N	U	N/A
3.	Attached lines have adequate flexibility	Y	N	U	N/A
4.	No collapse of overhead equipment, distribution systems, or masonry walls	Y	N		N/A
5.	Equipment is free from credible and significant seismic-induced flood and spray concerns	Y	N		N/A
6.	No credible seismic-induced fire concerns	Y	N		N/A
7.	No other "two over one" concerns as defined in DOE-STD-1021	Y	N		N/A
8.	No other concerns	Y	N	U	N/A
	Is equipment free of interaction effects?	Y	N	U	

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: HVAC Ducts**

HVAC line identification:

System:

Bounding Candidate Evaluation

Duct is not a candidate for bounding calculations Y N U N/A

Discussion:

Analytical Review

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

Equipment ID No.:	**Equipment Class: HVAC Ducts**
HVAC line identification:	
System:	

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS)		
ID No.:	**Equipment Class:**	
Building:		
Performance Category:	Floor El. (s):	Location:

Description or Sketch

Functionality Requirement

1. During seismic event	Y	N	U
2. After seismic event	Y	N	U

DOE Seismic Evaluation Procedure

SCREENING EVALUATION WORK SHEET (SEWS) (Cont.)

ID No.:	**Equipment Class:**	
Building:	Floor El. (s):	Location:

Comments

Screening Walkdown(s):

Date	Time	Team Members

Recommend Resolution

- ❑ Maintenance action: _____
- ❑ Further evaluation: _____
- ❑ Retrofit design: _____
- ❑ Other: _____
- ❑ No further action required. Equipment is seismically adequate.

All aspects of the equipment's seismic adequacy have been addressed.

Evaluation by: _____ Date: _____

(All team members) _____ _____

_____ _____

_____ _____

DOE Seismic Evaluation Procedure

OUTLIER SEISMIC EVALUATION SHEET (OSES)

1. OUTLIER IDENTIFICATION, DESCRIPTION, AND LOCATION

SEWS Form _____

Equipment ID Number _____ Equipment Class _____

Equipment Location: Building _____ Floor Elevation _____

Room or Row/Column _____ Base Elevation _____

Equipment Description _____

_____

Performance Category _____

2. OUTLIER ISSUE DEFINITION

a. Identify all the screening guidelines which are not met. (Check more than one if several guidelines could not be satisfied.)

Mechanical and Electrical Equipment		Tanks and Heat Exchangers	
Seismic Capacity vs. Demand	_____	Caveats	_____
Reference Spectrum Caveats	_____	Anchorage	_____
GERS Caveats	_____	Interaction Effects	_____
Anchorage	_____	Other	_____
Interaction Effects	_____		
Other	_____		

Essential Relays		Cable and Conduit Raceway Systems	
Seismic Capacity vs. Demand	_____	Seismic Capacity vs. Demand	_____
Interaction Effects	_____	Inclusion Rules Review	_____
Mounting, Type, Location	_____	General Walkdown Review	_____
Other	_____	Interaction Effects	_____
		Analytical Review	_____
		Other	_____

OUTLIER SEISMIC EVALUATION SHEET (OSES) (Cont.)

Piping		HVAC Ducts	
Screening Criterion	_____	Structural Integrity Review	_____
Other	_____	Pressure Boundary Integrity Review	_____
		Support Review	_____
		Interaction Effects	_____
		Analytical Review	_____
		Other	_____

b. Describe all the reasons for the outlier (i.e., if all the listed outer issues were resolved, then the signatories would consider this item of equipment to be evaluated for seismic adequacy):

_____

_____

_____

_____

_____

_____

3. PROPOSED METHOD OF OUTLIER RESOLUTION

a. Define proposed method(s) of resolving outlier:

_____

_____

_____

_____

_____

_____

OUTLIER SEISMIC EVALUATION SHEET (OSES) (Cont.)

b. Provide information needed to implement proposed method(s) for resolving outlier:

c. Provide information on potential hardware upgrades:

DOE Seismic Evaluation Procedure

SEDS (1 of 2) Sheet 1 of _____

SCREENING EVALUATION DATA SHEET (SEDS)							
Equip. Class (1)	Equip. ID No. (2)	System/Equipment Description (3)	Bldg. (4)	Floor Elev. (5)	Room or Row/Col (6)	Base Elev. (7)	Capacity Spectrum (8)

SIGNATURES:

All the information contained on this Screening Evaluation Data Sheet (SEDS) is, to the best of our knowledge and belief, correct and accurate. "All information" includes each entry and conclusion (whether evaluated to be seismically adequate or not).

Approved: All Seismic Capability Engineers on the Seismic Review Team should sign.

_____	_____	_____
Print or Type Name	Signature	Date
_____	_____	_____
Print or Type Name	Signature	Date
_____	_____	_____
Print or Type Name	Signature	Date

DOE Seismic Evaluation Procedure

SEDS (2 of 2) Sheet 2 of _____

SCREENING EVALUATION DATA SHEET (SEDS) (Cont.)							
F_{ED} (9)	Demand Spectrum (10)	Cap > Demand? (11)	Caveats OK? (12)	Anchorage OK? (13)	Interact. OK? (14)	Equipment OK? (15)	Notes (16)

ADDITIONAL SIGNATURES:

The information provided to the Seismic Capability Engineers regarding systems and operations of the equipment contained on this SEDS is, to the best of our knowledge and belief, correct and accurate.

Approved: Signature(s) of Systems or Operations Engineers are required if the Seismic Capability Engineers deem it necessary.

Print or Type Name	Signature	Date
Print or Type Name	Signature	Date
Print or Type Name	Signature	Date

14. REFERENCES

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13. Unresolved Safety Issue (USI) A-46, "Seismic Qualification of Equipment in Operating Plants", U.S. Nuclear Regulatory Commission, Rockville, Maryland, December 1980.

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17. NUREG-1211, "Regulatory Analysis for Resolution of Unresolved Safety Issue A-46, Seismic Qualification of Equipment in Operating Plants", U.S. Nuclear Regulatory Commission, Washington, D.C., February 1987.

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